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317/749-2052

August 15, 1972

MEMORANDUM

(E72-10009) - A LAND USE CLASSIFICATION OF  
THE TEXOMA FRAME (AN APPROXIMATELY SQUARE  
AREA OF 100 NAUTICAL MILES BOUNDARY,  
CENTERED ON A POINT D.A. Landgrebe (Purdue  
Univ.) 15 Aug. 1972 4 p CSCI 08H G3/13

TO: NASA Scientific and Technical Information Center

ATTENTION: ERTS Program  
P.O. Box 33  
College Park, Maryland 20740

FROM: NASA-Purdue Laboratory for Applications of Remote Sensing

SUBJECT: A Land Use Classification of the "Texoma Frame" (An  
approximately square area of 100 nautical miles boundary,  
centered on a point 15 miles south-east of Durant, Oklahoma  
and approximately 5 miles north of the Red River) and of  
two sub frames of this entire frame.

Summaries of results are enclosed for preliminary classification  
of (1) the ERTS I "Texoma" Full Frame (Purdue classification serial  
number 809207201, Purdue run number 72001400 digitized at line intervals  
of 2 and sample interval of 3), (2) the ERTS I Texoma Subframe (Purdue  
classification serial number 808207101, run number 72001401 with  
maximum resolution) and (3) the ERTS I Ouachita Mountain Subframe  
(Purdue classification number 0810206901, Purdue run number 72001406  
with maximum resolution).

The "Texoma" Full Frame and "Texoma" Subframe analyses were made  
under the NASA-Purdue contract, a Study of the Utilization of ERTS I  
Data from the Wabash River Basin. The analysis of the Ouachita Mountain  
Subframe was made under the NASA-Purdue contract, Interdisciplinary  
Analysis of ERTS Data for Colorado Mountain Environments, using ADP  
Techniques, Proposal No. SR040; GSFC identification number UN103.

Trusting these brief reports are in the form desired.

P.I. Dr. David A. Landgrebe

772-10009

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use made thereof."

## 2.A Land Use Classification

ERTS-1 Full Frame

Analysis of Classification Results

Classification Serial Number 809207201, Run Number 72001400

Digitized at Line Interval of 2, Sample Interval 3

Multispectral scanner data was analyzed on a digital computer to produce land use classification. The procedure involved automatic clustering and classification of various cover types to produce a map of land use. Features which have been identified in this analysis include four classes of water representing various levels of water quality. Shallow, silty water in Lake Texoma and in the Tishomingo Game Preserve appear distinctly different from water in the Atoka Reservoir. Natural and improved pastures and grasslands may be identified and their occurrence tends to follow soil type patterns on the ground. Forested areas are identified along stream drainages and in mountainous areas of heavy forest cover. Forest areas which have been converted to pasture and area in the process of conversion are easily identified. Interstate highways and rivers may also be seen in the imagery.

A lineament can be seen running southward from the Atoka Reservoir. It is in line with the known location of the Choctaw Fault and may represent some change in geologic structure associated with the fault.

## 2.A Land Use Classification

### ERTS-1 Texoma Subframe

Analysis of Classification Results  
Classification Serial Number 808207101, Run Number 72001401  
Maximum Resolution

Multispectral scanner data was analyzed on a digital computer to produce land use classification. The procedure involved automatic clustering and classification of various cover types to produce a map of land use. Features of interest which may be identified in the classification are several levels of water quality in Lake Texoma and the Tishomingo Reservoir. The imagery shows silting and delta formation by the Red River at the west end of Lake Texoma. Three levels of water quality may be seen beginning with silted, shallow, muddy water near the mouth of the Red River grading into slightly less silted water and finally into clean water in the main portion of the lake. The lake in Tishomingo Game Preserve shows two shades of water color indicating two grades of water quality. Wooded areas are shown along with small creeks and the Red River. Natural and improved pastures and grasslands are identified as rectangular shapes in the imagery as are several cotton and grain sorghum fields. Light colored pastures and sandy soils frequently having peanuts growing on them are shown on the north (Oklahoma) side of the lake.

## 2.A Land Use Analysis

Ouachita Mountain Subframe  
Analysis of Classification Results  
Classification Serial Number 0210206901, Run Number 72001406  
Maximum Resolution

This area has extremely diverse cover types and contains a number of significant geologic features, reservoirs, rivers, agricultural land, range land, and a large amount of forest cover. A preliminary analysis based on the spectral characteristics of the data was produced. Visual observations and oblique photography from light aircraft were then obtained along with information from local resource personnel. A second analysis was performed utilizing all of this new information.

Evidence of human activity may be seen in several areas. A clearing operation has taken place which forest cover has been removed, windrowed and converted to native grass rangeland. A nearby area is in the same process and has been aerially sprayed to kill mixed hardwood forest cover in the first step in conversion to rangeland. The location of a recently completed powerline was shown in the imagery and verified with ground observations.

Another interesting feature in the final classification was a distinct banding effect observed in the earth imagery and which is apparently related to the geologic structure of the area. Surface observations and aerial photos of these areas indicate that the differences are caused by a combination of topographic slope and aspect, vegetative density differences which were influenced by the underlying geologic structure, and observable moisture stress conditions in the forest cover in some of the geologic banded structures. In some portions of the area limestone outcroppings also caused a distinct spectral response thereby adding to the observed banding effect.

Differences in water quality were given as the cause for the spectral difference observed in the reservoirs in this area. These water quality differences were not particularly obvious to the eye from the light aircraft but showed up as distinct differences in channels 1 and 2 while all water bodies had very low response in channels 3 and 4 (infrared) of the MSS data.